(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 083 590 A3

# (12) EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
**30.05.2012 Bulletin 2012/22**

(43) Date of publication A2:
**29.07.2009 Bulletin 2009/31**

(21) Application number: **09150210.4**

(22) Date of filing: **08.01.2009**

(51) Int Cl.:
***H04W 16/10*** *(2009.01)* *H04W 84/22* *(2009.01)*

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK TR**
Designated Extension States:
**AL BA RS**

(30) Priority: **28.01.2008 GB 0801536**

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## (54) Communication systems

(57) An interference mitigation method in a wireless network in which a plurality of nodes share an available frequency spectrum by performing wireless communication on sub-channels defined within the available spectrum. The nodes are grouped into clusters, each cluster having a leader of the cluster. Preferably, every node in the cluster is a transceiver equipped to act as leader and this leader role is rotated around the cluster.

A first part of the method is a distributed or cluster-wide sub-channel allocation, performed on short time scales. For each cluster in turn, the leader finds a required number of sub-channels for its wireless communication. Then it monitors all the sub-channels to obtain a received interference level representing interference received from the other nodes on each of the sub-channels, and determines possible combinations of sub-channels for its own use, taking into account the interference levels found. Next, the leader determines (for example, by sending a test signal and requesting other nodes to provide the results) an inflicted interference level expected to be caused to the other nodes by some of the possible combinations of sub-channels, which may for example be tried at random. One of the combinations of sub-channels is then adopted, based on the received interference level and the inflicted interference level. Control then passes to another node in the cluster (for example by making it the new leader) and, if all nodes in one cluster have had their turn, the same process takes place in another cluster.

In another preferred feature of the method, the leader monitors the overall interference level in the cluster, and if this exceeds a first threshold, it requests the leader of another cluster to merge their clusters in an attempt to reduce the interference level in the merged cluster below the first threshold. Conversely, if the interference level falls below a second threshold, the leader may attempt to divide its cluster into two, and designate another node as the leader of one of the divided clusters. Meanwhile, if an attempt to reduce interference by merger is not successful, the leader may request a network manager to intervene. Thus, in a second part of the method, the network manager performs a centralized or network-level interference mitigation process by co-ordinating sub-channel allocation among the clusters.

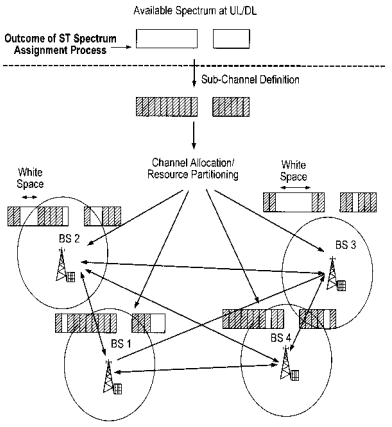



*Fig.5*

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# EUROPEAN SEARCH REPORT

Application Number
EP 09 15 0210

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
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The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
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| Munich | 19 April 2012 | Isopescu, Ciprian |

CATEGORY OF CITED DOCUMENTS

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| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
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## CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

## LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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## LACK OF UNITY OF INVENTION
## SHEET B

Application Number
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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-9, 13

   Method and wireless network for adopting sub-channels for a node in a cluster of nodes.

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2. claims: 10-12, 14, 15

   Methods and wireless networks to regulate the interference level in a cluster of nodes.

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## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 09 15 0210

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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19-04-2012

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